



2011 Revised Storm Water Standards Design and Construction Specifications Manual Training

DEPARTMENTS OF PUBLIC WORKS AND CODE ENFORCEMENT

APRIL 15, 2011

Agenda



- **Introduction**
 - John Oakley, DPW
 - Matt Kline, DCE
- **Background** – John Oakley, DPW
- **Plan for Implementation** – John Oakley, DPW
- **How Revisions Fit into Existing Standards**
 - Brad Dove, RebuildIndy
 - Frank Stewart, RebuildIndy

Agenda continued

- **Storm Water Design and Constructions Specifications Manual Revisions Overview**
 - Chapters 100 – 300
 - Questions and Answers
 - *Break*
 - Chapters 400 – 700
 - Chapter 561, Storm Water and Sediment Control
 - Questions and Answers
- **Conclusion**

Purpose of Training

- **This training is to discuss revisions to the Storm Water Design and Construction Specifications Manual and their application only.**
- **This is not a full training course on how to use the Storm Water Design and Construction Specifications Manual.**
 - You need some familiarity with the manual

Background

- **Indianapolis Storm Water Design and Construction Specifications Manual has:**
 - Been in use since 1995
 - Been updated only once with the addition of water quality standards (2001)
 - Has gone through internal and stakeholder review and input process
- **Updates needed to comply with regulatory changes**

Timeline



- **2007 – Stakeholder discussions began**
- **December, 2010 – Approved by the Board of Public Works**
- **February, 2011 – Became effective following no action by the City-County Council**
- **April – May, 2011 – Outreach and Training**
- **June 1, 2011 – New Manual Implementation**

Manual Revisions

- This presentation includes various fonts and color designations based on the printed version of the manual.
- **Red Font – Highlights the changes within each section of the manual.**
- Black Font – Shows existing text.
- Emphasis was added in some sections via underlining and/or italics.
- Not all changes, i.e. text, spelling, etc. are included in this presentation.

Hypothetical Redevelopment Project



Conditions:

- Commercial Site
- 1.5 acres
- Located in larger masterplanned development, originally started in the 1980's
- Served by existing detention pond and storm sewers
- 2004 - site expanded parking area by 0.47 acres
- 2011 - owners want to construct building expansion with additional parking, total proposed is 0.60 acres (0.49 acres of additional impervious surface)



Chapter 100

Policy and Procedures

Chapter 100 – Policy and Procedures



•Section 101.02, Applicability

Improvements to an existing developed site that is not developed to current storm water design standards and disturbs \Rightarrow 1/2 acre will be required to comply with the current storm water regulations for storm water quantity and quality, at twice the area disturbed within the existing contributing drainage area at the proposed site work and owned by the project/property owner. For example, if a property owner wants to add 1 acre of parking and plans to disturb 1.5 acres to do it, he would be required to mitigate 3 acres of development within the same watershed to meet the current storm water regulations. If there was only an additional .75 acres of existing contributing drainage area upstream of the disturbed area, the owner would be required to mitigate 2.25 acres of development.

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•Section 101.02, Applicability

Hypothetical Example:

Site is disturbing 0.60 acres, therefore the owner must mitigate a total of 1.2 acres of development within the watershed to current storm water standards.

Due to site being within a masterplanned area that includes water quantity management within the ponds, it is assumed that the current quantity standards are met. *Note: the engineer must document that the proposed improvements are in compliance with the masterplan.*

However, water quality has not been constructed therefore the site must mitigate 1.2 acres of area.

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•Section 101.04, Updating

Changes to the manual will be posted on the City's website as they are produced. Notification of the changes will be emailed to the DPW listserver registrants and posted on the City website.

Note: Listserver not up and running yet.

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•Section 101.05, Definitions and Abbreviations, BMP

BMP, GENERAL: Best management practice can refer to a structural measure (wetland, pond, sand filter, etc.) or non-structural measure (restrictive zoning, reduced impervious areas, etc.). BMPs are designed for the benefit of water quality and quantity control. For the purposes of this chapter, BMPs refer to structural water quality BMPs.

BMP, MANUFACTURED: Manufactured BMPs are wholly or partially prefabricated and delivered to a construction site for incorporation into the drainage system. Water quality inlets, cartridge filter systems, and hydrodynamic separators are examples of manufactured BMPs.

BMP, NATURAL: Natural BMPs are practices that utilize the natural infiltration and filtering processes of water flowing through vegetation, sand, soil, or other media to remove suspended and or dissolved pollutants from runoff. Examples include biofilters, rain gardens, vegetated swales.

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•Section 101.05, Definitions and Abbreviations, BMP (Con't)

BMP, NON-STRUCTURAL: Non structural BMPs are comprised of a wide range of activities and/or practices that control or reduce pollutants at their sources. Practices can include the use of natural processes, such as increased infiltration and bio-filtration, good housekeeping practices such as street sweeping or catch basin cleaning, or reduction of directly connected impervious areas. Activity based BMPs include public education, outreach, and involvement activities, such as drain marking and creek sweeps, zoning and regulation.

BMP, STRUCTURAL: Structural BMP, for the purposes of this manual, are BMPs that are built on site. Detention ponds, artificial wetlands, sand filters, and bio-filters are examples of structural BMPs.

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•Section 101.05, Definitions and Abbreviations, Contributing Drainage Area

Contributing drainage area refers to the total area that contributes runoff upstream of a point of interest, such as a development site.

•Section 101.05, Definitions and Abbreviations, Land Disturbance

Any manmade change of the land surface, including: removal of vegetative cover that exposes the underlying soil, excavating, filling, transporting, and grading.

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•Section 102.02, Plan Submittal and Approval Process

5. Operation and Maintenance Manual for all detention, storm water, and water quality structures.

Note: No longer applicable only to WQ units.

•Section 102.02, Plan Submittal and Approval Process

The zoning of any properties for which drainage permits are applied must be consistent with the proposed land use before drainage permits will be approved.

Note: Engineer should document the zoning designation and provide zoning commitments of the site to the reviewer. Technical review will not be completed until this is submitted.

Chapter 100 – Policy and Procedures



•Section 102.02, Plan Submittal and Approval Process

On-site land alteration, including clear cutting, stump removal, grading, and filling, shall not commence prior to approval of a drainage permit and installation of all sedimentation and erosion control devices required by the approved permit.

Chapter 100 – Policy and Procedures



•Section 102.03, Plan Submittal and Approval Process

Cover Sheet: A cover sheet shall be provided, including location and vicinity map. A map that indicates the location and vicinity of the proposed land alteration shall be included in the storm water plan. It shall reference a nearby major roadway intersection. The cover sheet shall also include site address, as assigned by DMD, the DMD Compliance Information Block and a storm water structure summary table. The summary table shall provide each proposed pipe size and respective length with the number of proposed structures.

Note: The cover sheet (title sheet) should include the compliance block referencing the Department of Code Enforcement (DCE).

Chapter 100 – Policy and Procedures



•Section 102.03, Plan Submittal and Approval Process

Existing and proposed storm water facilities: The storm water plan shall show the locations of all existing and proposed storm water facilities. Storm drains and manholes and other structures shall be located by dimensions on the plans in relation to surrounding physical features. However, the areas where physical features are not available, coordinates of manholes and bearings of storm drains shall be based either on the State of Indiana's coordinate system or **latitude and longitude . Indiana's State Plane Coordinate System shall be used to identify the location of the outlet of each BMP included it the plan.** The storm water plan shall show the direction of flow, elevation of inverts, gradient, materials and size of existing and proposed storm drains.

Note: It is recommended that a table be provided on the cover/title sheet with the coordinates of each BMP. The BMP's may be located in State Plane coordinates with an error of +, - 1 ft.

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•Section 102.03, Plan Submittal and Approval Process

For all Class 1 pipe (**within the R/W or conveying runoff from more than one parcel**), a plan and profile shall be submitted. Storm drain plan and profile: The plan shall be shown on the upper portion of the drawing. The plan, generally, shall be drawn on a scale that is clear and legible and not greater than one (1) inch equals fifty (50) feet.

The plan shall show appropriate right-of-way and easement limits **with instrument numbers, as applicable**. The profile shall be shown under the plan and shall extend a sufficient distance downstream of the outlet to allow any pertinent information concerning the outfall channel to be shown. All invert elevations and pipe slopes shall be listed. For each pipe the length, size, material and Class shall be annotated on the profile sheet near the dimension line. Detail title and/or number references shall be called out on the profile plan.

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•Section 102.03, Plan Submittal and Approval Process

The location of the predominant soil types on the site shall be described by a registered land surveyor or professional engineer. The description may be determined by the NRCS (Natural Resources Conservation Service, formerly the Soil Conservation Service, or SCS) County Soil Survey or an equivalent publication or as determined by a certified professional soil scientist.

Note: A map must be included as part of the Plan Sheets!

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•Section 102.03, Plan Submittal and Approval Process

Obligation to Observe. For land alterations that are not to be inspected and tested **by the City's inspection program**, storm water plans submitted under this section to the Department must include a "Certificate of Obligation to Observe" signed by a registered professional engaged in storm drainage design and by the Owner. The certificate shall be as presented on page A1-9. **If for any reason the registered professional becomes uninvolved in the project prior to its completion, the Department of Metropolitan Development must be notified and a new registered professional must be retained by the Owner and both a new "Certificate of Obligation to Observe" and a new "Certificate of Sufficiency of Plan" document must be executed.**

Note: Section 103.03 specifies the criteria for construction observation services.

Chapter 100 – Policy and Procedures



•Section 102.04, Technical Information Report

Each page and attachment of the TIR should be numbered and dated.

•Section 102.04, Technical Information Report

Drainage area calculations including both the gross and impervious area for each drainage basin/subbasin.

•Section 102.04, Technical Information Report

An explanation of computer models used, where applicable, with information from **input and** output data.

Chapter 100 – Policy and Procedures



•Section 102.06, Operations and Maintenance Manual

An operations and maintenance (O&M) manual for **all ~~PRIVATE~~ infrastructure, including but not limited to pipes, ponds, ditches, and BMPs** (when required), shall be submitted for the final plan approval and permit process. The manual will become a maintenance guide for the drainage infrastructure once development is complete. The final O&M manual will be provided to the City in **both hard copy and digital formats. The O&M manual maintenance agreement along with a site map showing the BMP locations shall be recorded with the final plat.**

Note: O&M Manual required for all infrastructure.

Note: An O&M Maintenance Agreement will be developed.

Chapter 100 – Policy and Procedures



•Section 102.06, Operations and Maintenance Manual

Site drawings (8½” by 11” or 11” by 17”), showing both plan and cross-section views, showing the infrastructure and applicable features, including dimensions, easements, outlet works, forebays, signage, etc., as well as an overall site map of the development showing all structures.

Notes:

The use of 11 x 17 sheets has already been occurring, but now can be cited.

With the inclusion of all storm water infrastructure in the O & M Manual, all structures need to be shown in the O & M Manual. Multiple sheets may be required for legibility.

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•**Section 102.06, Operations and Maintenance Manual**

Guidance on sediment **and trash removal**, both narrative and graphical, describing when sediment removal should occur in order to insure that BMPs **and other infrastructure** remain effective as water quality and/or quantity control devices;

•**Section 103.04, Drainage Fees**

The following schedule of fees is current as of May 1, 2007. Changes to this fee schedule will be posted on the Department of Code Enforcement website.

Chapter 100 – Policy and Procedures



•Section 103.05, Testing

All storm sewers using flexible pipe shall be tested for deflection by means of a go/no-go mandrel gage or other methods as approved by the Department

Note: See Manual, extensive changes!

Chapter 100 – Policy and Procedures



•Section 103.05, Testing

Forty-two (42) inch diameter and smaller reinforced concrete and corrugated metal pipe may be required to be inspected through closed circuit television viewing (CCTV) by the Department's representative as described herein. In those instances where CCTV is a required part of the storm water permit approval, this televised viewing shall be completed in conformance with these minimum guidelines.

Note: Televising may be required on a case-by-case basis and should be coordinated with the Department of Code Enforcement. Generally, if visual inspection or lamping reveals sufficient defects, the Department will require CCTV.

Chapter 100 – Policy and Procedures



•Section 103.07, Record Drawings

As part of the final acceptance process, record drawings of the storm water facilities must be submitted to the Department, as set forth herein, for the following types of developments:

- all platted subdivisions
- industrial and commercial sites one acre and larger
- all public infrastructure

Note: Previous manual stated 5 acres and larger.

Chapter 100 – Policy and Procedures



•Section 103.07, Record Drawings

Record drawings shall be certified by a Professional Engineer or Land Surveyor registered in the State of Indiana, and provide the following information:

- Horizontal alignment of storm drain pipes, culverts, **BMPs**, streets, and storm drain structures, to a minimum accuracy of +/- two (2) feet. **All BMPs will be located by Indiana State Plane Coordinates.**

- The as-built survey of all detention / retention facilities as well as as-built profile of all drainage conveyances (ditches, swales, etc).**

Note: As-built contours must be shown for ponds.

- A tag reference to the operations and maintenance manual **as required** for **storm water structures** will be included.

Chapter 100 – Policy and Procedures



•Section 103.07, Record Drawings (con't)

Sample Tag Note:

This site includes an Operations and Maintenance (O&M) Manual for all storm water infrastructure. Contact the Department of Code Enforcement for a copy of the manual.

Chapter 100 – Policy and Procedures



•Section 104.02, Storm Water Quality

For the purposes of this requirement, TSS are defined as particles that will pass through a 125 micron screen. Larger Particles are considered to be part of the total solid load of the storm water runoff.

•Section 104.02, Storm Water Quality

Floatables. The narrative standards in Section I.B.3 of the City's NPDES Storm Water Permit (No. INS040001) state that certain categories of floatables, or floating debris are not permitted in storm water discharges. The policy for floatable control in Indianapolis is that the drainage from all areas of new development and redevelopment will be designed to so as to capture and retain floating material. Individual components of the storm water control system do not have to comply with this policy, but the final discharge from the development site must.

Chapter 100 – Policy and Procedures

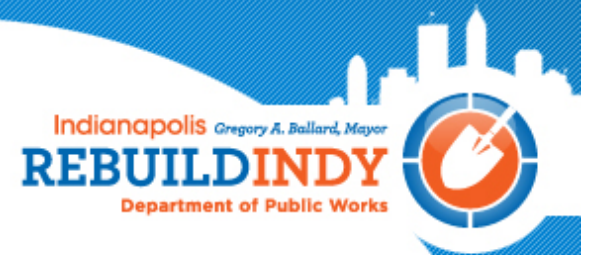


•Section 104.02, Storm Water Quality

For the purposes of all projects, including commercial, industrial, residential, transportation, recreation, etc., if the **cumulative** disturbed area is less than ½ acre, the development will be exempt from requirements for on-site BMPs. **The cumulative total disturbed area will be evaluated based on City records of permit activity from October 1, 2001.**

Note: A site history should be provided in the Technical Information Report (TIR). The site history can be a separate section of the report. The history must also include a description of all previous projects since October 1, 2001, the disturbed area of each project and applicable permit numbers.

Chapter 100 – Policy and Procedures



•Section 104.02, Storm Water Quality

Hypothetical Example:

Proposed disturbance is 0.60 acres. The developments since 2001 included a total disturbance of 0.49 acres. The total cumulative is 1.09 acres (0.49 acres in 2004 and 0.60 acres in 2011). Therefore, the site must comply with water quality for 1.09 acres minimum.

Since the mitigation requirement is greater than the cumulative water quality requirements, a minimum of 1.20 acres must be addressed for water quality.

Note: Again, the site history report in narrative should address the previous disturbances.

Chapter 100 – Policy and Procedures



•Section 104.03, Redevelopment Guidelines

When properties are redeveloped they are subject to the same policies and design standards as are applied to new development projects; including storm water permitting, detention, sediment and erosion control, and water quality management requirements.

Note: This section provides in-depth guidance pointing to green infrastructure.



Chapter 200

Hydrology

•Section 201.03, Hydrologic Method

The same hydrologic method should be used for pre-developed runoff peak determination as will be used the post-developed detention calculations.

•Section 201.03, Hydrologic Method

Rational Method may be used for peak runoff estimations when the total watershed area tributary to the design point is **five (5)** acres or less and with no existing depressional storage, provided analysis of "regional" detention/retention (D/R) facilities is not a required part of the computational procedure.

Note: Area reduced from 200 to 5 acres.

Chapter 200 – Hydrology



•Section 201.03, Hydrologic Method

USGS Regression equations are not applicable for projects within Marion County.

•Section 201.03, Hydrologic Method

Hydrograph generation and flood routing procedures shall be required when:

1. The total watershed area tributary to the design point is greater than five (5) acres or less than 5 acres with existing depressional storage;
2. Multi-basin analysis must be performed (multi-basin analysis can be required due to drainage patterns as well as land use (cover) changes and changes in soil types),

Chapter 200 – Hydrology

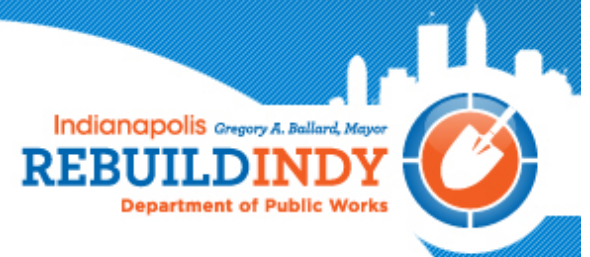


•Section 201.03, Hydrologic Method (Con't)

Multi-Basin analysis refers to runoff basins. Ponds designed with a single tributary area may use the Modified Rational Method. Ponds designed with more than one tributary basin should use hydrographs.

Pipe designs can use the Rational Method as described in Chapter 300 – Hydraulics regardless of the number of basins.

Chapter 200 – Hydrology



•Section 201.04, Design Storm Frequencies

Table 201.01

Driveway Culverts **10 year (1, 5)**

Note: Added to table for clarification

•Section 201.04, Design Storm Frequencies

5. Driveway culverts for in-fill development in residential areas sites are exempt from this requirement because inspectors examine the proposed culvert with respect to adjacent upstream and downstream driveway culverts. However, the Department reserves the right to require the analysis of any culvert.

•Section 201.06, When Downstream Conveyance Analysis and Detention/Retention not Required

1. The part of the storm water facility situated within the parcel shall drain adequately each and every part of the parcel and shall be sufficient to accept the present water runoff from developed and undeveloped areas upstream.
2. Approved fill areas which do not increase the amount of impervious area on-site to be more than a total of 0.5 acres, provided the existing runoff patterns and flow capacity of the property will not be altered by the filling operations. **The 0.5 acre threshold for analysis and detention will be determined as the cumulative amount of impervious area for all tracts, phases, and / or sections of the site.**



•Section 201.06, When Downstream Conveyance Analysis and Detention/Retention not Required

3. **Improvements** to existing commercial buildings, provided the total impervious area on-site, including roof tops, sidewalks, drives and parking lots, is not increased to be more than a total of 0.5 acres with no alteration to existing storm water facilities. **The 0.5 acre threshold for analysis and detention will be determined as the cumulative amount of impervious area for all tracts, phases, and / or sections of the building addition. The cumulative total will be evaluated based on review of permit records from October 1, 2001.**

Note: Now all improvements not just additions and the cumulative increase are to be considered.

Note: Existing storm water infrastructure may still need to be evaluated for impact from proposed improvements based on Chapter 561.

•Section 201.06, When Downstream Conveyance Analysis and Detention/Retention not Required

HOWEVER!!!

Section 561-333 Requires:

“A drainage facility shall be provided which allows drainage of water runoff from each upper watershed area and from each portion of the parcel to a place or places adequate to receive it.”

In addition, Section 561-336 Requires:

“As to drainage facilities located downstream of the parcel, the drainage system within the parcel shall be designed such that there will be no increase in peak discharge or runoff rates as a result of the development unless such downstream facilities are sufficient to accept...

•Section 201.06, When Downstream Conveyance Analysis and Detention/Retention not Required

Note: 561 overrides the design manual and downstream facility capacity should always be considered.

Example:

0.499 acre parking lot on existing building. While the manual does not REQUIRE detention, the receiving facility must be adequate to accept the increased runoff and facilities downstream must have capacity for the entire upstream watershed in the proposed development state.

Chapter 200 – Hydrology



•Section 201.06

Hypothetical Example:

Although the increase in impervious area is less than 0.50 acres, since the site is in a masterplanned area within existing detention, the site must document compliance with the existing detention parameters.

If the existing ponds lack adequate capacity, detention may be required to be addressed, i.e. onsite detention or expanding the existing ponds.

Since the development has a conveyance system (swales / pipes) from the site to the detention, the conveyance system must also be analyzed for capacity. If pipes lack adequate capacity, on-site mitigation may be required.

- **OLD Section 201.07, Downstream Analysis Requirements**

Downstream analysis also known as “Beat the Peak” has been completely deleted!!

Variations in the methods used and the approach were inconsistent. The analysis frequently did not account for all the facilities that impacted timing of the upstream flow such as detention ponds and existing storm sewer systems.

• **Section 202.02, Rainfall Distribution**

Staff has determined that Huff rainfall distributions most accurately reflect **rainfall conditions in** Indianapolis. The **appropriate** Huff storm distribution's fifty percent (50%) probability curve or column shall be used for hydrograph computations, as is applicable for the design methodology. Figure 202-2 and Table 202-3 can be referenced for the appropriate distribution.

1st, 2nd, and 3rd Huff Rainfall distributions should be applied as appropriate.

1st – 0 up to and including 6hr

2nd – 6.1 up to and including 12hr

3rd – 12.1 up to and including 24hr

- **Section 203.03, Overland Flow Time**

Overland flow in urbanized basins occurs from the backs of lots to the street, across and within parking lots and grass belts, and within park areas. Overland flow over plane surfaces for distances of less than **100 lineal feet** may be calculated using Manning's kinematic solution (Overton and Meadows 1976) to compute T_t .

Note: Although the worksheet currently indicates 300 feet for sheet flow, a maximum of 100 feet shall be used.

- **Section 203.04, Shallow Concentrated Flow**

After a maximum of **100** feet, overland flow will normally become shallow concentrated flow.

Chapter 200 – Hydrology



- ***Old Section 204.03, Regression Equations*** - **DELETED**

- ***Section 205.03, NRCS (SCS) Curve Numbers***

When two soils types are listed (e.g. drained / undrained) drained soil conditions should be used for the pre-developed / allowable release rate calculations and undrained conditions shall be assumed in the post-developed model for soils unaffected by the proposed construction.

Agricultural soils shall assume crops in good condition for the pre-developed / allowable release rate and bare with no cover for the post-developed model for soils unaffected by the proposed construction.

Chapter 300

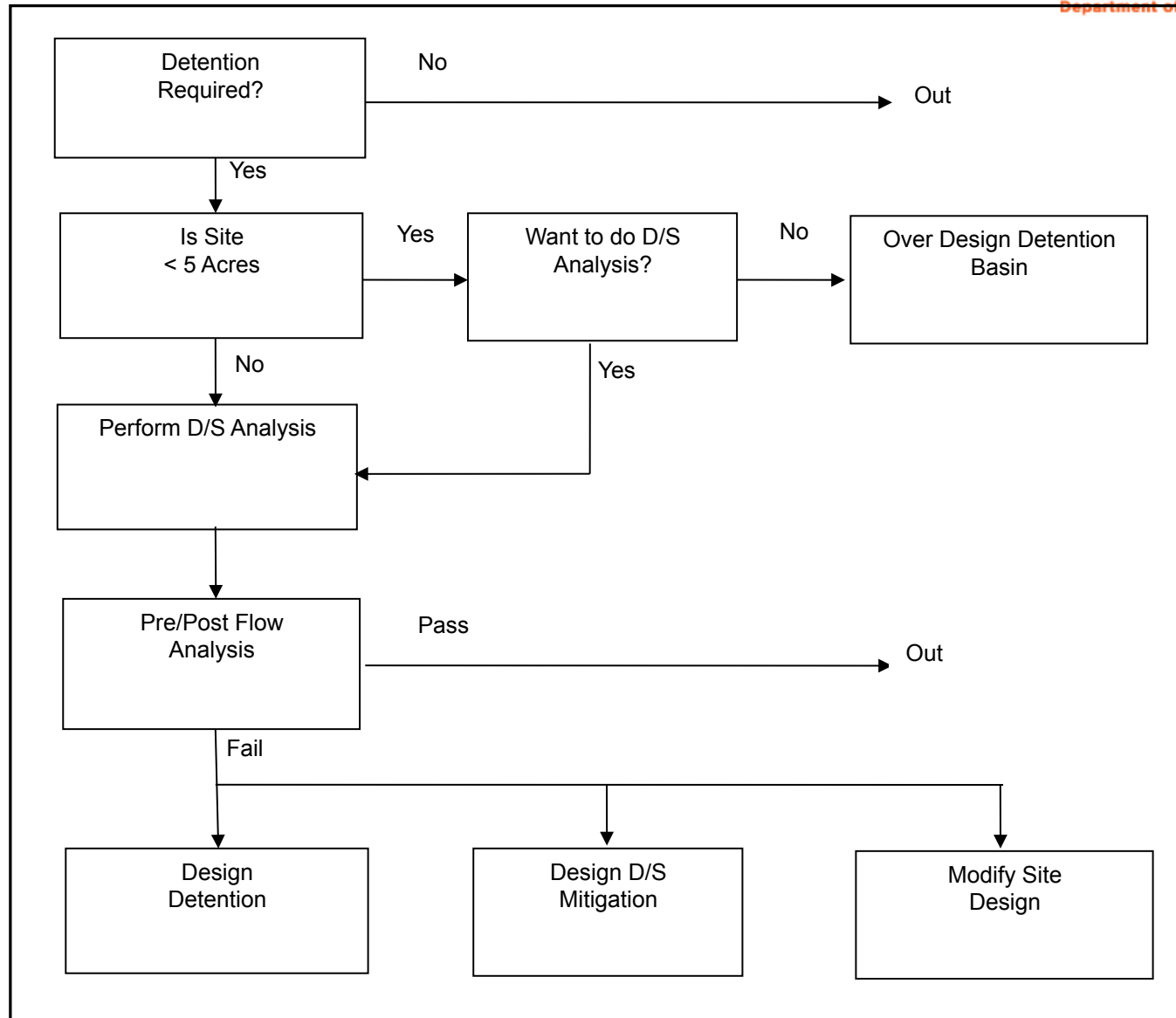
Hydraulics

- **Section 305.02, The Requirement for Detention/Retention (current)**

STEP 1: Is detention/retention required according to 201.06? If it is not the designer skips any consideration of *downstream analysis* or detention / retention. If detention/retention is required the designer proceed to step 2. The *downstream analysis* must assess each outflow point from the site separately.

Note: In this paragraph the downstream analysis refers to the old “beat the peak” analysis, which is no longer allowed, and not the downstream capacity analysis.

Chapter 300 – Hydraulics





•Section 201.06, REVIEW

Analysis of the downstream storm water conveyance system or the provision of detention/retention will not be required for the following:

1. Downstream facilities which after completion of the land development will not be accepting runoff from the developing property.
2. Approved fill areas which do not increase the amount of impervious area on-site to be more than a total of 0.5 acres, provided the existing runoff patterns and flow capacity of the property will not be altered by the filling operations. The 0.5 acre threshold for analysis and detention will be determined as the cumulative...
3. Improvements to existing commercial buildings, provided the total impervious area on-site, including roof tops, sidewalks, drives and parking lots, is not increased to be more than a total of 0.5 acres with no alteration to existing storm water facilities. The 0.5 acre threshold for analysis and detention will be determined as the cumulative

- **Section 305.02, The Requirement for Detention/Retention (current)**

STEP 2: Are any individual potential detention/retention sites draining areas less than 5 acres total including off-site drainage? If so the designer has the option as to whether or not to perform [downstream analysis](#). There may be good reasons to avoid [downstream analysis](#) in favor of increased detention design. If "NO" the designer performs an oversized detention/ retention design and proceeds with the design. If "YES" the designer goes to Step 3

STEP 3: The designer performs a [downstream capacity analysis](#) for the storm frequencies required for the storm water facilities encountered downstream. This will normally require the 10-, 25- and 100-year storms.

- **Section 305.02, The Requirement for Detention/Retention (current)**

STEP 4: The designer next performs the pre / post development discharge analysis described in Section 302.03. If the flows "PASS" the designer does not need to provide detention/retention, mitigation or site design modification.

STEP 5: If the site “FAILS” the flow test or if there is inadequate downstream capacity for the post-development discharge the designer performs one or a combination of detention/retention design, downstream storm water facility mitigation and/or site modification.

Step 5 is the key step to keep in mind.

Chapter 300 – Hydraulics



- **Section 305.02, The Requirement for Detention/Retention (proposed)**

STEP 1: Is detention / retention exempt according to 201.06? If so, the designer proceeds to Step 3. Otherwise, proceed to Step 2.

STEP 2: The designer next performs the pre / post development discharge analysis described in Section 302.03. If there is no increase in runoff, the designer proceeds to Step 3. If there is an increase, the designer proceeds to Step 4.

Chapter 300 – Hydraulics



- **Section 305.02, The Requirement for Detention/Retention (proposed)**

STEP 3: Are the downstream facilities adequate to accept the proposed peak runoff flow (i.e. what is the available capacity of the downstream facilities)? The designer performs a [downstream capacity analysis](#) for the storm frequencies required for the storm water facilities encountered downstream. This will normally require the 10-, 25- and 100-year storms. This analysis may include the first detention pond downstream and / or the first 15 inch or larger pipe downstream.

If the downstream facilities have adequate capacity for the proposed flow and are exempt from 201.06, then the designer does not need to provide detention / mitigation.

If the downstream facilities are not adequate for the proposed flow, the designer proceeds to Step 8.

- **Section 305.02, The Requirement for Detention/Retention (proposed)**

STEP 4: Are any individual potential detention/retention sites draining areas less than 5 acres total including off-site drainage? If "Yes" the designer may elect to perform an oversized detention/retention design and proceeds with Step 5. If "NO" the designer goes to Step 6.

STEP 5: If the designer wants to over design for detention, the designer must use the Modified Rational method as outlined in Section 302.05.

STEP 6: If the site is greater than 5 acres or the designer elects not to over design the detention basin then a downstream capacity analysis should be completed as described in Step 3. After completion of the downstream capacity the designer proceeds to Step 7.

Chapter 300 – Hydraulics



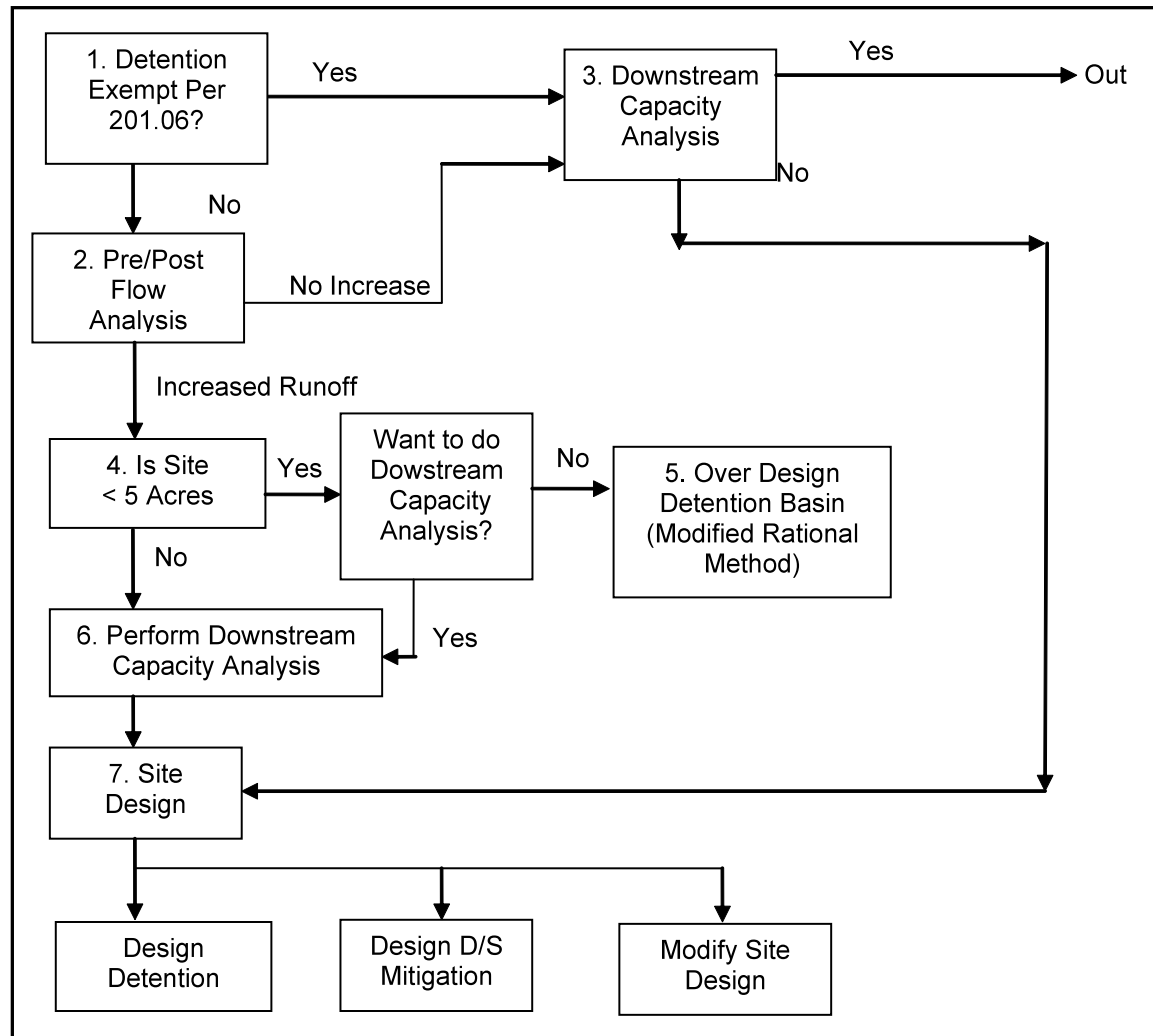
- ***Section 305.02, The Requirement for Detention/Retention (proposed)***

STEP 7: The site design should be completed by designing the detention to meet the detention requirements and/or mitigate downstream restrictions.

Chapter 300 – Hydraulics



• Section 305.02, The Requirement for Detention/Retention (proposed)





•Section 302.03, Minimum Performance Level of Detention/Retention Facilities

The minimum hydraulic performance levels and accepted design methodologies for detention/retention basins shall conform to the following:

$$Q_{2p} = 0.5 Q_{2e}$$

$$Q_{10p} = 0.5 Q_{10e}$$

$$Q_{25p} = 0.75 Q_{10e}$$

$$Q_{100p} = Q_{10e}$$

where:

Q_{2e} = 2 year discharge rate, existing conditions

Q_{10e} = 10 year discharge rate, existing conditions

Q_{2p} = 2 year discharge rate, developed conditions

Q_{10p} = 10 year discharge rate, developed conditions

Q_{25p} = 25 year discharge rate, developed conditions

Q_{100p} = 100 year discharge rate, developed conditions

- **Section 302.03, Minimum Performance Level of Detention/Retention Facilities**

Local basins are those which have a total land area contributing flow to the detention/retention basin, including on-site and off-site areas, of less than five (5) acres. **Local basin designs in which the designer elects to over design the detention basin in lieu of performing *downstream analysis*, may be designed using the Modified Rational Method as set forth herein. All other detention/retention designs shall use runoff hydrographs and routing techniques.**

Local basins can be designed by the Modified Rational Method, ALL other detention basins must be designed using hydrograph methods.

- **Section 302.03, Minimum Performance Level of Detention/Retention Facilities**

Regional basins are those which have a total land area contributing flow to the basin, including on-site and off-site areas, of five (5) acres or larger. **In addition to the discharge rate requirements above, the following velocity requirements shall apply for regional basins:**

$$V_{2p} = V_{2e}$$

$$V_{10p} = V_{10e}$$

$$V_{25p} = V_{10e}$$

$$V_{100p} = V_{10e}$$



•Section 302.03, Minimum Performance Level of Detention/Retention Facilities

Regional basins are those which have a total land area contributing flow to the basin, including on-site and off-site areas, of five (5) acres or larger. In addition to the discharge rate requirements above, the following velocity requirements shall apply for regional basins:

where:

V_{2e}	=	2 year velocity, existing conditions
V_{10e}	=	10 year velocity, existing conditions
V_{2p}	=	2 year velocity, developed conditions
V_{10p}	=	10 year velocity, developed conditions
V_{25p}	=	25 year velocity, developed conditions
V_{100p}	=	100 year velocity, developed conditions

All regional detention/retention designs shall use runoff hydrographs and routing techniques.



- **Section 302.03, Minimum Performance Level of Detention/Retention Facilities**

When computing the discharges for detention/retention basin design the entire upstream area that contributes runoff to the design point must be included in the computations. Areas that are bypassed for all levels of flow are the only allowable reductions in drainage area

- **Section 302.04, Increased Detention/Retention In Lieu Of Downstream Analysis**

For local basins an increased level of detention/retention may be used in lieu of the downstream analysis described in Chapter 200, sections 201.05 through 201.06. **If this option is selected**, the design shall conform to the requirements for a local basin plus:

The storm water runoff from all impervious area on the site shall be routed through the detention/retention facility, **unless otherwise approved**.

- **Section 302.04, Increased Detention/Retention In Lieu Of Downstream Analysis**

Minor collector swales located within residential or commercial developments, or collector swales located within open land uses such as agricultural fields, golf courses, and parks and recreation areas, as examples, will not be considered acceptable outfalls for a detention/retention providing this level of runoff control, unless a low flow system **with an underdrain** is installed downstream to convey trickle flows from these basins

Chapter 300 – Hydraulics



- **Section 302.05, Modified Rational Method**

Notes:

- Cr factors shown in the table should be used for pre-development conditions regardless of the existing surface types.
- Required detention volume should be based on the volume after the adjustment using the Huff Storm Factor (Equation 302.04)

Chapter 300 – Hydraulics



- **Section 302.06, Bypassing Flow**

When storm water detention/retention is required, all parts of the developing site should drain through the detention/retention basin, unless otherwise approved. Upstream drainage areas may be bypassed and therefore not considered in the computations as long as the conditions set in Section 302.03 are met.

Note: This is for all design storm events.

- **Section 302.07, Detention/Retention Facility Design**

The flow path from all inlets in a dry detention basin to the outlet of the basin shall be provided with an under-drain system.

- **Section 302.07, Detention/Retention Facility Design**

All wet detention/retention facilities shall have a safety bench/shelf at the normal pool level. The safety bench shall have a minimum width of ten (10) feet and a slope no steeper than 4 (horizontal) to 1 (vertical).

If a retaining wall adjoins the normal pool of a wet detention pond the wall shall have either steps or a ladder incorporated into the construction at the center of the wall span.

- **Section 302.07, Detention/Retention Facility Design**

When retention facilities are designed information must be provided on the plans that supports the ability of the structure to retain water, including the soil types on the site and a geologist's report showing how the site will infiltrate water.

Chapter 300 – Hydraulics



- **Section 302.07, Detention/Retention Facility Design**

Proper operations and maintenance practices for all detention/retention structures and their appurtenances, such as emergency spillways, will be identified in the Operations and Maintenance Manual, as required in Section 102.06.

- **Section 302.08, Design of Detention/Retention Facility Emergency Spillways**

Many types of emergency spillways are allowable provided adequate provision is made for the discharge of the flow through the facility and a minimum freeboard of one-foot (1) is provided for larger regional ponds above the maximum anticipated flow depth through the emergency spillway. All emergency spillways shall outlet to an easement containing a channel with acceptable capacity.

All calculations, easement delineation, and cross sections for the emergency spillway are to be submitted for review.

Chapter 300 – Hydraulics



- ***Section 302.11, Easements***

All detention/retention basins shall be constructed within a storm water easement either platted or legally described and recorded as a perpetual storm water easement a minimum of twenty (20) feet horizontally outside of the design 100-year flood water elevation of the basin.

- ***Section 302.11, Easements***

All emergency spillways will have an easement that extends from the crown of the emergency spillway structure to the point where the spillway enters the downstream drainage system.

- **Section 303.02, Easements/Minimum Flood Protection Elevations**

Collector Swales

Surface water collector swales within the rear yard and side yard areas of residential subdivisions, on all non-residential parcels, **and for all bypassed flow conveyances** shall be constructed within a drainage easement possessing a minimum width of twenty (20) feet. For residential properties the drainage swale should be generally constructed approximately in the middle of the easement.

Note: Now all swales must have easements, previously only swales serving greater than 5 acres had easements.



•Section 303.02, Easements/Minimum Flood Protection Elevations

Structures to be constructed that are not located in a flood control district regulated by the Flood Control Districts Zoning Ordinance of Marion County, Indiana, shall conform with the following requirements:

The first finished floor of new structure to be constructed adjacent to a surface drainage feature which drains areas between 150 and 640 acres shall be located at an elevation at least two feet above the maximum 100-year water surface elevation. The 100-year water surface elevation may be established through the use of a single cross-section analysis.

Note: As usual, 2 foot FPG for area >640 acres.

Chapter 300 – Hydraulics



- **Section 303.03, Grading and Depth of Open Channels / Swales**

The rock used in side-slope rip-rap shall be no smaller than 6 inches.

- **Section 303.03, Grading and Depth of Open Channels / Swales**

Minor drainage collector swales in rear yards and between homes shall possess a maximum channel length of 400 lineal feet **and no off-site water**, unless subsurface tile is also provided. The required channel slope and invert treatment for minor drainage collector swales shall be as follows: swales shall be grass lined; **subsurface drainage tile shall be required if the channel slope is less than 2.0%**; and, the minimum channel slope shall be 0.3%.

For basement residential lots a “tee” should be provided in the rear lot line’s subsurface drain for the purpose of discharging sump pump water directly into the drain.

Note: T-locations should be capped soil tight in field and identified on as-builts.

Chapter 300 – Hydraulics



- ***Section 303.04, Grading and Depth of Open Channels / Swales***

Concrete is no longer acceptable for swale invert treatment.



•Section 305.03, Design of Open Channels Using Manning's Equation

The use of Manning's equation shall be considered acceptable for determination of storm drain pipe sizes **when the design discharge is ninety percent (90 %) or less of the capacity of a commercially available pipe as computed by Manning's equation.** The storm drain system must be capable of passing the 10-year storm event with free water surface elevations below the crown of the pipe.

Design computations of storm drain pipe systems using the Rational Formula and Manning's equation shall be submitted with the storm water permit application on the Storm Drain Flow Tabulation Form provided by Figure 305-1 or by suitable computer program output listing giving similar information. Typical Manning's "n" values for standard storm drain materials are provided in Table 305-1. **Head loss computations shall be submitted with the storm water permit application on the form provided by Figure 305-2.**

Chapter 300 – Hydraulics



•Section 305.03, Design of Open Channels Using Manning's Equation (Con't)

HOWEVER !!:

Section 102.04 of the manual states:

1. Design Calculations. Design calculations are required as part of the storm water plan and shall, at a minimum, specifically include:
 - d. Storm drain flow and hydraulic grade line computations as described in Section 305.03 and 305.04. A Storm Drain Flow Tabulation Form has been provided on page A3-14. A Headloss Calculation Sheet has been provided on page A3-16. A form to assist with completion of culvert ratings has been provided on page A3-7.

Note: The use of a manufactured BMP (SQU) also requires that HGL calculations be completed for the pipes upstream and downstream of the SQU.



STR NO	10 YEAR FLOW CFS	PIPE SIZE (in)	PIPE SLOPE (%)	PERCENT OF CAPACITY	PIPE CAPACITY
1	73.99	36	1.92	73.8%	100.21
2	58.14	42	0.42	82.4%	70.59
3	59.02	42	0.4	85.6%	68.91
4	52.21	42	0.4	75.8%	68.9
5	8.19	18	0.7	86.1%	9.51
6	4.69	15	0.6	86.4%	5.43
7	23.02	30	0.33	90.0%	25.59
8	20.9	30	0.5	66.5%	31.42
9	18.76	30	0.5	59.7%	31.42
10	15.79	24	0.6	83.2%	18.98
11	12.78	24	0.5	73.7%	17.34
12	9.74	24	0.5	56.2%	17.34
13	6.57	18	0.5	81.7%	8.04
14	3.32	15	0.5	67.1%	4.95
15	24.19	42	0.4	34.9%	69.28
16	24.73	34 X 53	0.4	35.4%	69.95
17	21.79	29 X 45	0.4	47.9%	45.45
18	17.68	30	0.4	62.9%	28.11
19	13.52	30	0.4	48.1%	28.11
20	9.18	24	0.4	59.2%	15.5
21	4.69	18	0.4	65.1%	7.2
22	8.19	18	0.7	86.1%	9.51
23	4.69	15	0.6	86.7%	5.41
24	17.8	36	0.5	34.9%	50.95
25	18.5	36	0.4	40.4%	45.75
26	18.83	24 X 38	0.4	67.1%	28.07
27	15.51	24 X 38	0.4	55.2%	28.12
28	13.13	24	0.4	84.7%	15.5
29	10.47	24	0.4	67.5%	15.51
30	5.38	18	0.4	74.8%	7.19
31	2.67	15	0.5	53.9%	4.95
32	3.19	15	0.5	64.6%	4.94

Pipe shown at 86.4% of manning's capacity.

All pipes shown at or below 90% of the manning's capacity.



Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev	
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)
1	End	111.000	1.22	17.53	0.30	0.37	14.23	10.0	11.7	5.1	72.69	100.1	10.57	36	1.92	758.06	760.19	761.06	762.89	766.61	768.27
2	1	55.000	0.18	12.37	0.85	0.15	10.51	5.0	9.9	5.5	57.76	70.48	7.46*	42	0.42	760.19	760.42	762.89	762.98	765.21	767.50
3	2	300.000	0.18	12.19	0.85	0.15	10.36	5.0	9.1	5.7	59.02	68.93	7.34	42	0.40	760.42	761.62	763.44	764.13	767.50	770.00
4	3	120.000	0.18	10.61	0.85	0.15	9.02	5.0	8.7	5.8	52.24	68.93	5.43	42	0.40	761.62	762.10	765.62	765.89	770.00	770.00
5	4	189.000	0.61	1.40	0.85	0.52	1.19	5.0	5.3	6.9	8.19	9.51	4.64	18	0.70	762.10	763.42	767.22	768.20	770.00	767.14
6	5	60.000	0.79	0.79	0.85	0.67	0.67	5.0	5.0	7.0	4.69	5.42	3.82	15	0.60	763.42	763.78	768.70	768.97	767.14	768.65
7	4	347.000	0.44	4.29	0.85	0.37	3.65	5.0	6.9	6.3	23.00	25.58	4.69	30	0.33	762.10	763.25	767.22	768.15	770.00	768.96
8	7	60.000	0.44	3.85	0.85	0.37	3.27	5.0	6.7	6.4	20.89	31.42	4.26	30	0.50	763.25	763.55	768.66	768.79	768.96	769.46
9	8	60.000	0.57	3.41	0.85	0.48	2.90	5.0	6.4	6.5	18.76	31.42	3.82	30	0.50	763.55	763.85	768.94	769.04	769.46	769.96
10	9	60.000	0.57	2.84	0.85	0.48	2.41	5.0	6.2	6.5	15.79	18.98	5.03	24	0.60	763.85	764.21	769.16	769.41	769.96	770.46
11	10	60.000	0.57	2.27	0.85	0.48	1.93	5.0	6.0	6.6	12.78	17.33	4.07	24	0.50	764.21	764.51	769.60	769.77	770.46	770.96
12	11	60.000	0.57	1.70	0.85	0.48	1.45	5.0	5.6	6.7	9.74	17.33	3.10	24	0.50	764.51	764.81	769.89	769.99	770.96	771.46
13	12	60.000	0.57	1.13	0.85	0.48	0.96	5.0	5.4	6.8	6.57	8.04	3.72	18	0.50	764.81	765.11	770.06	770.26	771.46	771.96
14	13	60.000	0.56	0.56	0.85	0.48	0.48	5.0	5.0	7.0	3.32	4.95	2.71	15	0.50	765.11	765.41	770.37	770.51	771.96	772.46
15	4	119.000	0.18	4.74	0.85	0.15	4.03	5.0	7.9	6.0	24.19	69.22	2.51	42	0.40	762.10	762.58	767.22	767.28	770.00	770.98
16	15	189.000	0.61	4.56	0.85	0.52	3.88	5.0	6.7	6.4	24.73	69.96	2.52	34	0.40	762.58	763.34	767.52	767.62	770.98	768.14
17	16	60.000	0.79	3.95	0.85	0.67	3.36	5.0	6.4	6.5	21.79	45.39	3.06	29	0.40	763.34	763.58	767.86	767.92	768.14	768.64
18	17	60.000	0.79	3.16	0.85	0.67	2.69	5.0	6.1	6.6	17.68	28.10	3.60	30	0.40	763.58	763.82	767.99	768.09	768.64	769.14
19	18	60.000	0.79	2.37	0.85	0.67	2.01	5.0	5.7	6.7	13.52	28.10	2.75	30	0.40	763.82	764.06	768.19	768.24	769.14	769.64
20	19	60.000	0.79	1.58	0.85	0.67	1.34	5.0	5.4	6.8	9.18	15.50	2.92	24	0.40	764.06	764.30	768.30	768.39	769.64	770.14
21	20	60.000	0.79	0.79	0.85	0.67	0.67	5.0	5.0	7.0	4.69	7.19	2.65	18	0.40	764.30	764.54	768.45	768.56	770.14	770.64

HGL is above the
crown of pipe
and rim
elevation

Invert = 763.42
Crown = 764.67
HGL = 768.70
Rim = 767.14

HGL for all
pipes
above the
crown of
pipe.

Chapter 300 – Hydraulics



- **Section 305.03, Design of Open Channels Using Manning's Equation**

Proper operations and maintenance practices for all storm drain and inlet structures and their appurtenances will be identified in the Operations and Maintenance Manual, as required in Section 102.06.

- **Section 305.06, Non-Gravity Flow Systems**

3. An indemnification of the City relative to the non gravity-flow design.

Note: A standard Indemnification Agreement is available on the City's website.



- **Section 305.08, Gutterline Hydraulic Evaluation**

Inlets in roadway gutter lines must be spaced to prevent flow from entering public road intersections. In addition, inlets should be spaced intermediately in residential street gutter lines to allow one lane (based on the lane width of the road) of traffic to remain open **during the 100-year storm event**. Multi-lane facilities may have one travel lane on each side of the roadway flooded **during the 100-year storm event**. The design storm for all of the conditions is the 10-year storm event.

Note: required one travel lane does not include curb and gutter, i.e. 30' b-b curb roadway with 2' curb and gutter on each side would require a 13' open travel lane ($30' - 4' = 26' / 2 = 13'$)



QUESTIONS?



BREAK



Chapter 400

Storm Sewer Pipe and Open Culvert Materials

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



- **Section 401.07, Portland Cement Pervious Concrete Pavement (also known as PCPC)**

Portland Cement Pervious Concrete Pavement shall be constructed in full conformance with those guidelines set forth below. The Department of Public Works shall maintain a list of the approved products for these facilities.

Accepted Locations for use

Use of PCPC within the existing or proposed public right-of-way or in other areas maintained by the City of Indianapolis shall not be allowed unless approved in writing by DPW.

PCPC may be used on private property as an alternate pavement material and an alternate for traditional piping and detention system.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



- **Section 401.07, Portland Cement Pervious Concrete Pavement (also known as PCPC) (Con't)**

Design Guidelines

*All PCPC facilities acting as a detention facility shall be designed with a positive gravity outfall or a certification from a licensed geotechnical engineer stating;
that the permeability of the surrounding soils will dissipate water at a rate required for the detention facility designed,
that no adverse impact to any subsurface systems (including septic systems) will be experienced, and,
that the PCPC detention facility will not be subject to ground water surcharge during any time of the year.*

Use as a detention facility in “Well-Head Protection Areas” must have positive outfalls and an impermeable lining.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



- **Section 401.07, Portland Cement Pervious Concrete Pavement (also known as PCPC) (Con't)**

If the system is designed to use the storage volume of the stone surrounding the structure, *a 40 percent porosity factor* shall be utilized for the surrounding washed #8 stone.

All storm water shall be routed through a Storm Water Best Management Practice (BMP), also described as Storm Water Quality Unit (SQU), meeting City Standards. These units are approved to be downstream of the PCPC.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



- **Section 401.07, Portland Cement Pervious Concrete Pavement (also known as PCPC) (Con't)**

No storm water shall be routed through the detention facility until the Storm Water Best Management Practice (BMP) is installed and fully functional and all construction erosion control for disturbed areas are installed to ensure no sediment build-up in the underground detention storage facility. The erosion control methods and BMP's must be inspected after each rain event and repaired or cleaned where necessary. The O&M Manual for all BMP's or SQU's located prior to the underground detention storage facility require the BMP's to be inspected (4) times per year and cleaned as necessary to ensure maximum performance relative to sediment removal.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



- **Section 401.07, Portland Cement Pervious Concrete Pavement (also known as PCPC) (Con't)**

Maintenance

The owner shall be responsible for maintenance.

When PCPC is used as part or all of a detention system the owner's engineer is required to submit an Operation & Maintenance Manual during the permitting/approval process describing the maintenance frequency and methods. *Annual cleaning is required after the last snowfall or by April 30th of each year.*

The city has the right to inspect the system and to require replacement if it fails or is a threat to public safety. *PCPC is considered to be failing if water can be seen standing on it or in it (within the concrete pavement section), unless the storm event is above a 100-year event. If maintenance does not correct the problem, full or partial replacement may be required.*

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



- **Section 402.04, Pipe Materials**

No Major changes , except :

The selected pipe material (from the above list) should be identified on the submitted plans.

Note: Confirmation the pipe material must be given on the plans.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Section 403.05, High Density Polyethylene Pipe (HDPE)

MANUFACTURED WYES, TEES, ELBOWS, OR ADAPTERS WILL NOT BE ACCEPTED FOR USE IN PLACE OF PRECAST STORM SEWER MANHOLES AND BOX INLETS **UNLESS PREVIOUSLY APPROVED BY THE DEPARTMENT.**

PRECAST MANHOLES AND BOX INLETS WILL BE REQUIRED WITHIN HDPE STORM SEWER SYSTEMS AT CHANGES IN GRADE, ALIGNMENT, SIZE, AND PIPE MATERIAL TYPE, AS OUTLINED WITHIN CHAPTER 500 OF THIS MANUAL **UNLESS PREVIOUSLY APPROVED BY THE DEPARTMENT.**

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Section 403.06, Polyvinyl Chloride Pipe (PVC)

PRECAST MANHOLES AND/OR BOX INLETS WILL BE REQUIRED WITHIN PVC STORM SEWER SYSTEMS AT ALL CHANGES IN GRADE, ALIGNMENT, SIZE, AND PIPE MATERIAL TYPE, AS OUTLINED WITHIN CHAPTER 500 OF THIS MANUAL MANUFACTURED WYES, TEES, ELBOWS, OR ADAPTERS WILL NOT BE ACCEPTED FOR USE IN PLACE OF MANHOLE OR BOX INLET STRUCTURES **UNLESS PREVIOUSLY APPROVED BY THE DEPARTMENT.**

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Section 403.09, High Impact Polypropylene or High-Density Polyethylene Plastic Facilities

All underground detention facilities shall be designed with *a positive gravity outfall or a certification from a licensed geotechnical engineer;*

- that the permeability of the surrounding soils will dissipate water at a rate required for the detention facility designed,
- that no adverse impact to any subsurface systems (including septic systems) will be experienced,
- and that the underground detention facility will not be subject to ground water surcharge during any time of the year.

Any facility that allows exfiltration within a “*Well-Head Protection Areas*” *needs prior approval* from the Department of Public Works Office of Environmental Services.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Section 403.09, High Impact Polypropylene or High-Density Polyethylene Plastic Facilities (Con't)

If the system is designed to use the storage volume of the stone surrounding the structure, *a 40 percent porosity* factor shall be utilized for the surrounding washed #8 stone.

All storm water shall be routed through a Storm Water Best Management Practice (BMP) meeting City Standards.

No storm water shall be routed through the detention facility until the Storm Water Best Management Practice (BMP) is installed and fully functional and all construction erosion control for disturbed areas are installed to ensure no sediment build-up in the underground detention storage facility. The erosion control methods and BMP's must be inspected after each rain event and repaired or cleaned where necessary. *The O&M Manual for all BMP's located prior to the underground detention storage facility require the BMP's to be inspected (4) times per year and cleaned as necessary to ensure maximum performance relative to sediment removal.*

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Section 403.09, High Impact Polypropylene or High-Density Polyethylene Plastic Facilities (Con't)

Note: BMP's are required upstream of the detention facility with the exception of the PCPC systems.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Chapter 400

Hypothetical Example:

If the conveyance system lacks adequate capacity, on-site mitigation may be required. Since additional parking is proposed, systems such as the PCPC system (Section 401.07) or an alternative underground system may be utilized in the design.

Additional methods, i.e. parking lot detention and/or green designs (to be discussed later) may also be explored.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Section 404.06, Bench Walls

Bench walls shall be shaped and formed for a clean transition with proper hydraulics to allow the smooth conveyance of flows through the manhole or box inlet. The bench wall shall form a defined channel, to a minimum height of 80-percent of the inside diameter of the inlet and outlet pipes to form a “U” shaped channel, constructed at a minimum ½-inch per foot slope to the manhole wall.

Where a flow channel is constructed as an integral part of the pre-cast base, it shall be shaped and formed as described above, with the exception that the bottom of the flow channel may be formed from the bottom of inlet and outlet pipes if the pipe wall thickness is not greater than one (1) inch.

For cast-in-place flow channels, the bottom invert of all pipes entering a manhole shall be at least three (3) inches above the top of the base slab to the outlet invert so the finished sewer channel may be installed and shaped

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Section 404.07, Manhole Precast Adjusting Rings

A **water tight** seal shall be provided between the precast manhole and riser ring, each adjoining riser ring, and between the riser ring and casting by the use of either two (2) rows of ½ inch extrudable preformed gasket material, non-asphaltic mastic, or trowelable grade butyl rubber, as shown in Figure 400-05 of the Standard Details.

Concrete adjusting rings shall conform to ASTM C 478 and be free from voids, cracks, and other defects. The adjusting ring shall be from the same manufacturer as the manhole cone section to assure compatibility and a watertight seal per Figure 400-05.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Section 404.08, Precast Concrete Box Inlets and Precast Spacers

For precast concrete box inlets, the adjustment of casting frame and grate shall be accomplished using precast concrete spacers of a minimal nominal thickness of six (6) inches. The maximum number of spacers allowed shall be four (4). A **water tight** seal shall be provided between each component of the precast box inlet and precast concrete spacers by use of non-asphaltic mastic, or trowelable grade butyl rubber.

•Section 404.09, Box Inlet and Manhole Dimensions

Steps shall conform to the requirements of ASTM C 478 and be manufactured using steel rods encased in polypropylene plastic. Steps shall be factory installed when the manhole is manufactured.

•Old Section 405.03 – Slotted Drains - Deleted.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Section 405.03, Rejection of Castings

All storm water inlets and catch basins shall have the words “No Dumping, Drains to Stream”, or similarly approved message, cast in raised or recessed letters at a minimum of 1” in height. In addition, a symbol of a fish shall also be cast with the letters.

•Section 406.02, General Requirements

SUBSURFACE TILE SYSTEMS **ARE** REQUIRED TO BE PROVIDED WITH A "Y" CLEANOUT CONNECTOR AT A MINIMUM INTERVAL OF 400 FEET.

Minimum size -The minimum size for all subsurface drains will be 6”

End Treatment -All subsurface tile that drains to an open ditch or swale must provide animal guards as per Section 503-07.

Chapter 400 – Storm Sewer Pipe and Open Culvert Materials



•Section 406.03, Accepted Materials

Polyethylene pipe under this specification may be provided as a corrugated single wall, or double walled with a corrugated outer wall and smooth inner wall. **All public infrastructure using HDPE must use double wall pipe. All public infrastructure using PVC should meet ASTM 3034 specifications, at a minimum.**



Chapter 500

Installation of Storm Water Facilities

Chapter 500 – Installation of Storm Water Facilities



•Section 501.12, Trench Installations

All PVC and HDPE pipes to be installed with perforations that are meant to infiltrate or exfiltrate must use #8 stone as bedding and backfill material. All approved storm systems can use class 1 bedding and backfill materials with the following compaction requirements. INDOT Classification No.5, No.8, and No 9 must be at least hand tamped or walked into place. INDOT Classification No.53 must be mechanically compacted to 95% Proctor.

Chapter 500 – Installation of Storm Water Facilities



•Section 501.14, Bedding and Backfill Materials

CMP Bedding

Class I material shall be shovel sliced or otherwise carefully placed and **mechanically compacted** to ensure proper compaction and complete filling of all voids.

RCP Bedding

Class II material shall be shovel sliced or otherwise carefully placed and **mechanically compacted** from three (3) to six (6) inches (based upon pipe diameter) below the pipe barrel, to 1/6th the outside pipe diameter (Bc).

Chapter 500 – Installation of Storm Water Facilities



•Section 501.14, Bedding and Backfill Materials (Con't)

PVC -Bedding and Initial Backfill

Plastic Pipe conduits (PVC and HDPE) shall be provided with No. 8 crushed stone or approved Class I granular bedding material shovel sliced or otherwise carefully placed and **mechanically compacted** from four (4) to six (6) inches (based upon pipe diameter) below the pipe barrel, to a minimum of twelve (12) inches above the crown of the pipe



Chapter 600

Erosion and Sediment Control

Chapter 600 – Erosion and Sediment Control



•Section 602.02, Requirements

Land alterations which disturb **1** or more acres - Rule 5 (327 IAC 15-5), and all non-single-family residential land disturbing activities, - Chapter 561 and these regulations

Land alterations which disturb less than 1 acre - all single-family residential land disturbing activity less than one acre shall employ, at a minimum, perimeter type erosion and sediment control practices. Gravel access drives may also be required at the discretion of the Director or his representative.

Perimeter erosion control shall be employed outside of completed easement areas. Established easement areas are not to be disturbed during construction process.

Construction/Stormwater Pollution Prevention Plan - Technical Review and Comment (Form 1)

Project Name: 0
Date Reviewed: 01/00/00

The technical review and comments are intended to evaluate the completeness of the Construction/Stormwater Pollution Prevention Plan for the project. The Plan submitted was not reviewed for the adequacy of the engineering design. All measures included in the plan, as well as those recommended in the comments should be evaluated as to their feasibility by a qualified individual with structural measures designed by a qualified engineer. The Plan has not been reviewed for other local, state, or federal permits that may be required to proceed with this project. Additional information, including design calculations may be requested to further evaluate the Plan.

All proposed stormwater pollution prevention measures and those referenced in this review must meet the design criteria and standards set forth in the "Indiana Stormwater Quality Manual" from the Indiana Department of Natural Resources, Division of Soil Conservation or similar Guidance Documents.

Please direct questions and/or comments regarding this plan review to:

0

Please refer to the address and contact information identified in the Plan Review Section on page 1.

Assessment of Construction Plan Elements (Section A)

The Construction Plan Elements are adequately represented to complete a plan review:

☒ Yes ☒ No

The items checked below are deficient and require submittal to meet the requirements of the rule.

A		A	
<input type="checkbox"/> 1	Index showing locations of required Plan Elements	<input type="checkbox"/> 2	11 by 17 inch plat showing building lot numbers/boundaries and road layout/names
<input type="checkbox"/> 3	Narrative describing the nature and purpose of the project	<input type="checkbox"/> 4	Vicinity map showing project location
<input type="checkbox"/> 5	Legal Description of the Project Site (Include Latitude and Longitude - NOI Requirement)	<input type="checkbox"/> 6	Location of all lots and proposed site improvements (roads, utilities, structures, etc.)
<input type="checkbox"/> 7	Hydrologic unit code (14 Digit)	<input type="checkbox"/> 8	Notation of any State or Federal water quality permits
<input type="checkbox"/> 9	Specific points where stormwater discharge will leave the site	<input type="checkbox"/> 10	Location and name of all wetlands, lakes and water courses on and adjacent to the site
<input type="checkbox"/> 11	Identification of all receiving waters	<input type="checkbox"/> 12	Identification of potential discharges to ground water (abandoned wells, sinkholes, etc.)
<input type="checkbox"/> 13	100 year floodplains, floodways, and floodway fringes	<input type="checkbox"/> 14	Pre-construction and post construction estimate of Peak Discharge (10 Year storm event)
<input type="checkbox"/> 15	Adjacent landuse, including upstream watershed	<input type="checkbox"/> 16	Locations and approximate boundaries of all disturbed areas (Construction Limits)
<input type="checkbox"/> 17	Identification of existing vegetative cover	<input type="checkbox"/> 18	Soils map including soil descriptions and limitations
<input type="checkbox"/> 19	Locations, size and dimensions of proposed stormwater systems (e.g. pipes, swales and channels)	<input type="checkbox"/> 20	Plans for any off-site construction activities associated with this project (sewer/water tie-ins)
<input type="checkbox"/> 21	Locations of proposed soil stockpiles and/or borrow/disposal areas	<input type="checkbox"/> 22	Existing site topography at an interval appropriate to indicate drainage patterns
<input type="checkbox"/> 23	Proposed final topography at an interval appropriate to indicate drainage patterns		

Indianapolis Gregory A. Ballard, Mayor
REBUILDINDY
Department of Public Works



•Section 602.02, Requirements

Land alterations which must comply with Rule 5 (327 IAC 15-5) requirements should include tables on the plans which address Sections A, B and C of the Rule 5 plan review checklist.

Construction/Stormwater Pollution Prevention Plan - Technical Review and Comment (Form 1)

Project Name: 0
Date Reviewed: 01/00/00

Assessment of Stormwater Pollution Prevention Plan (Sections B & C)

Stormwater Pollution Prevention Plan - Construction Component (Section B)

Adequate	Deficient	Not Applicable	B	The construction component of the Stormwater Pollution Prevention Plan includes stormwater quality measures to address erosion, sedimentation, and other pollutants associated with land disturbance and construction activities. Proper implementation of the plan and inspections of the construction site are necessary to minimize the discharge of pollutants. The Project Site Owner should be aware that unforeseen construction activities and weather conditions may affect the performance of a practice or the effectiveness of the plan. The plan must be a flexible document, with provisions to modify or substitute practices as necessary.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	Description of potential pollutant sources associated with construction activities
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2	Sequence describing stormwater quality measure implementation relative to land disturbing activities
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3	Stable construction entrance locations and specifications (at all points of ingress and egress)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4	Sediment control measures for sheet flow areas
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5	Sediment control measures for concentrated flow areas
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6	Storm sewer inlet protection measure locations and specifications
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7	Runoff control measures (e.g. diversions, rock check dams, slope drains, etc.)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8	Storm water outlet protection specifications
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9	Grade stabilization structure locations and specifications
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	10	Location, dimensions, specifications, and construction details of each stormwater quality measure
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	11	Temporary surface stabilization methods appropriate for each season (include sequencing)
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	12	Permanent surface stabilization specifications (include sequencing)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13	Material handling and spill prevention plan
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14	Monitoring and maintenance guidelines for each proposed stormwater quality measure
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15	Erosion & sediment control specifications for individual building lots

Stormwater Pollution Prevention Plan - Post Construction Component (Section C)

Adequate	Deficient	Not Applicable	C	The post construction component of the Stormwater Pollution Prevention Plan includes the implementation of stormwater quality measures to address pollutants that will be associated with the final landuse. Post construction stormwater quality measures should be functional upon completion of the project. Long term functionality of the measures are critical to their performance and should be monitored and maintained.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	Description of pollutants and their sources associated with the proposed land use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2	Sequence describing stormwater quality measure implementation
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3	Description of proposed post construction stormwater quality measures (Include a written description of how these measures will reduce discharge of expected pollutants)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4	Location, dimensions, specifications, and construction details of each stormwater quality measure
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5	Description of maintenance guidelines for post construction stormwater quality measures



•Section 602.02, Requirements

Land alterations which must comply with Rule 5 (327 IAC 15-5) requirements should include tables on the plans which address Sections A, B and C of the Rule 5 plan review checklist.



•Section 603.03, General Criteria for Erosion and Sediment Control Practices

Vegetative Control - Disturbed areas which are at finish grade shall be permanently seeded within seven (7) days. **Vegetation must be established within one-hundred and eighty (180) days with 90% coverage or reseeded.** At the discretion of the Director: barren areas to be rough graded and left undisturbed for more than thirty (30) days shall be established with temporary vegetation; and dormant seeding will be required during seasonal periods (October through February) for those barren areas to be left undisturbed for one-hundred and twenty (120) days or longer.

Note: 90% coverage / density

•Section 603.05, Access Drives and Parking Areas

Stone based construction access drives and parking areas, with a minimum size of 20' x 50' in width and length, must be placed at all ingress and egress points used by vehicles to enter and leave the perimeters of a subdivision or commercial site.

Note: Developments which include paved entrances to be used for construction ingress/egress should provide maintenance notes on the plans.



Chapter 700

Water Quality

Chapter 700 – Water Quality



•**Section 701.01, Section Description**

This chapter provides design criteria and information for storm water quality best management practices, or BMPs that are required **in order for newly developed or re-developed properties to comply with the City's policies for managing the quality of storm water runoff found in Section 104.02.**



•Section 701.03, Storm Water Quality Control Requirements

The City of Indianapolis has adopted a countywide storm water runoff quality policy (Section 104.02) based on the control of total suspended solids and floatables in storm water runoff. In addition, designers may be required to include the control of fecal bacteria or pollutants that are associated with a specific land use, such as hydro-carbons that are associated with retail gasoline outlets, in their designs. The water quality design requirements are as follows;

TSS. BMPs must be capable of removing 80% of the TSS load from post-construction runoff. For the purposes of this requirement, TSS is defined as particles smaller than 125 microns in diameter. Larger material is considered to be part of the total solids load of the storm water runoff.



•Section 701.03, Storm Water Quality Control Requirements (Con't)

Floatables. BMPs shall incorporate floatables control. The goal of this requirement is to capture floating debris and remove it as part of the routine maintenance of the BMPs. Stand alone BMPs must include floatables control. For BMP systems, or treatment trains, at least one of the components of the BMP system, located after the last inflow point to the system, must provide control of floatables.

Note: it is recommended that submerged outlets be considered whenever possible to minimize potential blockage, i.e. negative slope pipe, hood (Snout), etc. Screens tend to plug easily and if used must be included in the O&M Manual for frequent cleaning.

Chapter 700 – Water Quality



•Section 701.04, Storm Water Quality Design Methods

Performance Based

- In order to meet the TSS removal goals, performance based BMPs must be designed to treat the first flush runoff. The first flush runoff volume is estimated by computation of the water quality volume (WQv), which represents the runoff volume from a storm of one inch depth over the drainage area.

Proprietary Design

-The design process for an innovative BMP that is approved for use in the City of Indianapolis may be based on design flow capacity, on design volume, or other testing procedures approved by the City

Note: In general, volume based vs. flow based.

Chapter 700 – Water Quality



•Section 701.04, Storm Water Quality Design Methods

The following materials must be submitted in support of the application to approve a new BMP or process for use in the City of Indianapolis:

Narrative ..., Detailed description of the maintenance procedures, Detailed drawings of the practice or unit, Detailed description of the practice or unit's testing procedures, and Results of all tests.

The following performance criteria must be met by the proposed new BMPs. The BMPs:

Must meet the 80% TSS removal rate;

Must meet the floatable removal requirement;

May be required to reduce fecal bacteria;

May be required to control hydrocarbons or other land use-specific pollutants in storm water runoff; and,

Must have a low to medium maintenance requirement to be considered by the City for use on public projects.

Chapter 700 – Water Quality



•**Section 701.05, Inspection and Maintenance**

- Each BMP (a single practice or combination of practices that meet the treatment goal) on a site must be identified in the operations and maintenance plan as specified in Section 102.06.

- The number of BMPs on a site will be determined as follows; for each distinct drainage area that requires a storm water quality control measure either a single BMP or a treatment train (system of 2 or 3 BMPs) will be required. Each BMP system treating a single drainage area is deemed to be one BMP for inspection purposes.

Chapter 700 – Water Quality



•**Section 701.05, Inspection and Maintenance**

Note: Field changes of BMP's must be re-submitted for approval by DCE. Re-submittal must include updated plans, water quality calculations and O&M Manual.

Chapter 700 – Water Quality



•Section 702.01, Storm Water Ponds

-Design the pond with a minimum length to width ratio of 3:1 (preferably expanding outward toward the outlet), **measured from the pond inlet to the pond outlet**. Irregular shorelines for larger ponds provide visual variety. **This length to width ratio must be met for each inlet to the pond.**

Note: Pond inlet should be considered the forebay outlet.

-When designing the BMP for the contributing drainage area, assume that the entire upstream watershed is fully developed. When designing the BMP for the effective drainage area where offsite areas bypass the BMP, the design shall only consider the drainage from the site. **Again, assume that the entire upstream watershed from the site is fully developed.**

-A wet storm water pond is characterized by a permanent wet pool. **The designer must evaluate both the soils and the hydrology of the site to insure that the pond will maintain a permanent wet pool.** (Note: Chapter 300 allows dry detention ponds, however, little water quality benefit is provided from dry detention ponds.)

Chapter 700 – Water Quality



•Section 702.01, Storm Water Ponds (Con't)

- Design and install an emergency drain (i.e. sluice gate or drawdown pipe) capable of draining within 24 hours. Where topographical limitations prevent the use of a sluice gate or drawdown pipe, the design should indicate a pump may need to be used to draw down the pond and the pump rate specified to meet the 24-hr drawdown period.
- Emergency spillway designed to pass 1.25 times the peak inlet flow rate and peak flow velocity from the 100-year storm event for the entire contributing drainage area (unless bypassed), assuming post-development conditions (see Section 302.08).
- Provide trash racks, filters, hoods or other debris control. The debris control should meet the minimum floatable capture requirements.

Chapter 700 – Water Quality



•Section 702.01, Storm Water Ponds (Con't)

-If orifices are utilized for drawdown purposes for stages above the permanent pool the orifices are to be protected against clogging by use of screening or other means. If the outlet diameter is ~~larger~~ (less) than 2 inches then the minimum orifice diameter allowed is 2 inches.

-Tall plantings in the aquatic bench are desirable as a means to keep waterfowl from the site. Waterfowl are bacteria sources and are to be discouraged from inhabiting wet ponds. Long, narrow, irregularly shaped ponds with tall plantings are encouraged in order to minimize attractiveness of the pond to waterfowl.

Note: the 2 inch minimum orifice is presumed to apply to all detention facilities.

Chapter 700 – Water Quality



•**Section 702.02, Storm Water Wetlands**

- The wetland must be designed for an extended detention time of 48 hours for the WQ_v . The orifices used for extended detention will be vulnerable to blockage from plant material or other debris that will enter the basin with storm water runoff. Therefore, some form of protection against blockage must be installed (such as some type of non-corrodible wire mesh or a stone-protected filter fabric).
- The minimum orifice size allowable will be 2 inches for the outlet control structure.

Chapter 700 – Water Quality



•Section 702.03, Bioretention

Bioretention: Intended use for drainage *areas 5 acres or less*, however if hydraulic and hydrologic design criteria are met, sites may be designed to manage multiple 5 acre watersheds.

Micro-bioretention: Intended to be versatile and can be adapted for use anywhere there is landscaping. *Contributing drainage area < 20,000 ft²*

Rain garden: Typically used to treat runoff from small impervious areas like rooftops, driveways, and sidewalks. Rain gardens can also be used in retrofitting and redevelopment applications and in series where existing slopes require energy dissipation. *Contributing drainage area < 10,000ft².*

Chapter 700 – Water Quality



•Section 702.03, Bioretention (Con't)

-Bioretention areas are engineered facilities in which runoff is conveyed as sheet flow to the “treatment area,” consisting of a pretreatment area, including a sediment forebay, ponding area containing vegetation with a planting soil bed, organic/mulch layer and gravel and perforated pipe underdrain system. The filtered runoff is typically collected and returned to the conveyance system, though it can be infiltrated into the in-situ soils in areas with porous soils (>1”/hour), though infiltration may not be permitted in Wellfield Zoning Districts or hotspot locations. If no perforated pipe underdrain system is used, a geotechnical investigation, soil infiltration testing, and a hotspot investigation must be completed.

-Design components should include:

Energy dissipation to reduce velocities and spread flow into the bioretention ponding area.

Inflow diversion or an overflow structure to carry flows greater than designed hydrologic capacity.

Note: Read entire section.

Chapter 700 – Water Quality



•**Section 702.03, Bioretention (Con't)**

Site and Design Considerations

The following design and site considerations must be incorporated into the BMP plan including bioretention areas:

- The drainage area (contributing or effective) must be 5 acres or less, though 0.5 to 2 acres is preferred. **Alternative designs can vary by location but NOT hydraulic/hydrologic design considerations.**
- The planting soil bed must be at least **2** feet deep.
- **Pretreatment, including forebay**, design for pre-treatment must follow the requirements outlined in Section 702.06

Chapter 700 – Water Quality



•**Section 702.03, Bioretention (Con't)**

Site and Design Considerations (Con't)

-The underdrain collection system must be equipped with a 6 inch perforated PVC pipe in an 8-inch gravel layer. The pipe must have 3/8-inch perforations, spaced on 6-inch centers with a minimum of 4 holes per row, **or equivalent**. The pipe is spaced at a maximum of 10 feet on center, and a minimum grade of 0.5% must be maintained. A permeable filter fabric or **a gravel lens (3/4-1/4 inch, crushed rock 2 to 3 inches deep)**, is placed between the gravel layer and the planting soil bed.

-The depth from the bottom of the bioretention facility to the **documented** seasonally high water table must be a minimum of 2 feet. **The seasonal high water table must be field determined by a soil scientist or geo-technical investigation.**

Chapter 700 – Water Quality



•**Section 702.03, Bioretention (Con't)**

Site and Design Considerations (Con't)

- Runoff captured by facility must have **energy dissipation** to prevent erosion of the organic or mulch layer. Velocities entering the mulch layer must be **less than or equal to 1.5 ft/s**.
- All components of the BMP must be located within an easement. Access to the BMP must be located within **the easement**.

Chapter 700 – Water Quality



•Section 702.03a, Micro-Bioretenction

NOTE: SEE NEW SECTION !

The following items should be addressed to ensure proper maintenance and long-term performance of micro-bioretenction practices:

The top few inches of filter media should be removed and replaced when water ponds for more than 24 hours. Silts and sediment should be removed from the surface of the filter bed when accumulation exceeds one inch.

Where practices are used to treat areas with higher concentrations of heavy metals (e.g., parking lots, roads), **mulch should be replaced annually**. Otherwise, the top two to three inches should be replaced as necessary.

Occasional pruning and replacement of dead vegetation is necessary. If specific plants are not surviving, more appropriate species should be used. Watering may be required during prolonged dry periods.

Note: See Green Infrastructure Supplemental document for a sample O & M Manual.

Chapter 700 – Water Quality



•Section 702.03b, Rain Gardens

NOTE: SEE NEW SECTION !

Maintenance Criteria: The following items should be addressed to ensure proper maintenance and long-term performance of rain gardens:

- Privately owned practices must have a maintenance plan and shall be protected by easement, deed restriction, ordinance, or other legal measures preventing its neglect, adverse alteration, and removal.
- The top few inches of the planting soil should be removed and replaced when water ponds for more than 48 hours. Silts and sediment should be removed from the surface of the bed as needed.
- Where practices are used to treat areas with higher concentrations of heavy metals (e.g., parking lots, roads), mulch should be replaced annually. Otherwise, the top two to three inches should be replaced as necessary.
- See Green Infrastructure Supplemental document for a sample O & M Manual.

Chapter 700 – Water Quality



•Section 702.05, Water Quality Swales

-The maximum design flow depth is 1 foot, **for all storm events**, with a ponding depth of 18 inches at the end of the channel.

Note: This includes the 100-yr event.

-Underlying soils shall have a high permeability ($f_c > 0.5$ inches per hour). Seasonally high water table must be greater than 3 feet below the bottom of the swale. **The seasonal high water table must be determined by a practicing soil scientist of geo-technical investigation.**

-**The underdrain must have a minimum of 2 feet of planting soil above the crown.**

- **The planting soil should be removed or replanted when ponding time exceeds 36 hours.**

Chapter 700 – Water Quality

- **Section 702.07, Catch Basin Inserts**

Reminder – Still must be approved by the City.



Chapter 700 – Water Quality



•Chapter 700

Hypothetical Example:

Since our site is required to mitigate a minimum of 1.20 acres to comply with water quality requirements, Chapter 700 should be explored for applicable alternatives.

It should be noted that portions of the existing site may be required to be modified to meet the 1.20 acre mitigation requirement. Since parking is included, landscape islands may be added or modified to meet water quality requirements. Manufactured BMP's may be installed on existing or proposed pipe systems.

An O&M Manual would be required for the site. In some cases easements may be required on existing pipe systems.

Chapter 700 – Water Quality



•Chapter 700

Hypothetical Example:

- The project submittal should include a technical report with all pages numbered and dated.
- The narrative should clearly indicate the detention and water quality requirements with mitigation breakdown.
- All calculations applicable to the project should be included (pipes, water quality, etc.)
- Since a masterplan is involved, copies of the applicable portions of the masterplan should be included (calculations, basin maps, etc.). Also a comparison of the proposed site curve number to the approved masterplan curve number should be provided.
- The plans should include all infrastructure information on the title sheet, including state plane coordinates for the water quality BMP.
- An O&M Manual will be required addressing the site infrastructure, including existing infrastructure previously installed.

Marion County

Code of Ordinances

Chapter 561

Drainage and Sediment Control

Section 561



•Section 561.271, Variance

(a)The administrator of the bureau of license and permit services, after consultation with the engineering division of the department of public works, shall have the power to modify or waive any minimum drainage standard found in Article III of this chapter or any regulations promulgated by the board of public works pursuant to Article III of this chapter. The administrator may, but is not required to, grant such a modification or waiver if an applicant for a drainage permit makes a substantial showing:

(1)That a minimum drainage standard regulation is infeasible or unreasonably burdensome; and

(2)That an alternate plan submitted by the applicant will achieve the same objective and purpose as compliance with minimum drainage standards and regulations.

(b)The request for a variance together with supporting information shall be made in writing to the administrator who shall make a decision within twenty (20) days and file a copy of his or her decision with the board of public works.



QUESTIONS?